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DEC 04 2006

REMARKS

By this amendment, claims 6 and 7 are canceled and claims 1-4 are revised to place this application in immediate condition for allowance. Currently, claims 1-4 are before the Examiner for consideration on their merits. Claims 5 and 8-10 are withdrawn as allegedly belonging to a non-elected species.

Turning first to the restriction requirement, the Examiner explains that the species I, II, and III are related to Figures 2-4, not Figures 11-13. While Applicants agree with this position, the restriction requirement made in the Office Action of June 15, 2006 combined Figures 2 and 11, Figures 3 and 12, and Figures 4 and 13 in the listing of species, and this was the reason for Applicants argument.

Secondly, claims 2-4 are revised as requested by the Examiner.

In the prior art rejection, claims 1-4 stand rejected under 35 U.S.C. § 103(a) based on JP 2003-37112 to Adachi Hisashi (Hisashi) in view of JP #10-270369 to Motoyama Takeshi (Takeshi). Here, the Examiner alleges that Hisashi teaches the features of claim 1 except for teaching the combination of a heat treatment jig that is mounted on a heat treatment boat of a vertical heat treatment furnace. In response to this failing, the Examiner cites Takeshi to show a wafer support and a vertical boat. For claims 2-4, it is alleged that the dimensions do not add anything critical to the claims and do not lend patentable merit to claim 1.

Claims 1-4 are also rejected under 35 U.S.C. § 103(a) based on JP 09-199438 to Yamaga Kenichi et al. (Kenichi). Here, the Examiner appears to allege that Kenichi anticipates claim 1 by alleging that the features thereof are disclosed in Kenichi. There is no position taken that Kenichi does not teach one or more limitations for claim 1. Thus, clarification of the rejection is requested. For claims 2-4, the same position is taken regarding the dimensions of as was done for the rejection

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based on the combination of Hisashi and Takeshi.

Applicants respectfully traverse the rejection and set for the arguments in the headings of the Invention and the applied prior art.

INVENTION

To review, the heat treating of a semiconductor wafer involves a heat treatment boat which is placed in a heat treatment furnace. A pair of jigs are used as part of the support of the wafer in the boat. A first jig comes into direct contact with the wafer, with the second jig or holder supporting the first jig and being placed in the heat treatment boat, see paragraph [0025] of Applicants' published application.

In addition, the first jig is constituted of silicon material and the holder is essentially constituted of a material having a high strength at elevated temperatures such as silicon carbide. The surface roughness and surface flatness of the first jig and holder are stipulated as described in paragraph [0026] of the published application.

The revision to claim 1 is made to clarify the relationship between the first jig and holder. That is, the first jig that contacts a back surface of the wafer is placed on a holder and the first jig can move relative to a contacting surface of the holder.

HISASHI AND TAKESHI

A close reading of Hisashi shows that this reference is unrelated to the invention, and it cannot be relied upon to establish a *prima facie* case of obviousness against claims 1-4. Hisashi, which is identified in the specification as prior art to the invention, discloses a heat treatment jig that is used in a vapor-phase growth method. The jig has a center protrusion that supports a

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center of the back surface of the semiconductor substrate and at least one circular arc that supports the back surface of the substrate. On all or part of the contact surface of the center protrusion and the circular arc is a capping member that comes into contact with the semiconductor substrate, see paragraph [0017] of Applicants' published application.

The center protrusion is made to have at least the same height with or a little lower height than that of the circular arc in the region corresponding to the center portion of the semiconductor substrate. Providing this arrangement makes it possible for the center protrusion to securely come into contact with the substrate, thus enabling a contact at the circular arc as well, and efficiently dispersing the weight of the substrate.

The amendment to claim 1 wherein the first jig is movable relative to the holder establishes a clear distinction with Hisashi. According to the invention, the first jig that contacts the back surface of the wafer and is placed on the holder is able to move relative to the holder surface. On the one hand, since the wafer and first jig are made of silicon, any relative displacement due to the difference in thermal expansion coefficient does not take place between them. On the other hand, even if bonding of the first jig and holder might locally occur, no force of constraint should appear between the first jig and the holder, wherein the wafer would not be affected by the holder having a different thermal expansion coefficient. Therefore, it is possible to prevent slip of the wafer.

Turning back to Hisashi, the capping member cannot be considered to be the first jig since it is not movable relative to the center protrusion or circular arc. The capping member is built in the upper surface or into the whole body of the center protrusion or the circular arc provided on the heat treatment jig made of silicon carbide. Again, the capping member is not structured to move relative to the center protrusion or the circular arc. In this regard, if bonding

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of the back surface of the silicon wafer and the capping member made of silicon occurs, the force of constraint exerts between the capping member and the center protrusion or circular arc. What this means is that the wafers can be affected by the heat treatment jig made of silicon carbide having a different thermal expansion coefficient. With the arrangement of Hisashi, slip of wafer is likely to occur.

Since Hisashi is completely different from the jig and holder arrangement of claim 1 as amended, the rejection can only be maintained if Takeshi would supply the missing features of Hisashi. Takeshi discloses a wafer support for use in a vertical boat that has recesses which come in a variety of configurations. One configuration allows communication between with the outer and inner periphery of the support. Another configuration uses through holes. Gas blowing through the recesses or through holes prevents the wafer from sticking to the support.

In the rejection, the Examiner alleges that Takeshi teaches a first jig and holder, identifying the first jig as silicon material and the second jig as the support 3. This stance does not make sense since there is only one jig in Takeshi. Therefore, Takeshi does not make up for the failings of Hisashi and cannot support a rejection under 35 U.S.C. § 103(a).

While it is not disputed that Takeshi teaches a vertical boat for a heat treatment furnace, this alone does not resolve the question of obviousness. Takeshi still does not teach a first jig and holder arrangement as set forth in claim 1, as amended.

Turning now to claim 2, it is submitted that given the configuration of Hisashi, it is unnecessary to limit specific dimensions of the first jig and the holder in terms of flatness and surface roughness. While it is true that it may be considered obvious to optimize result effective variables, the configuration of Hisashi leads to the conclusion that control of surface roughness and flatness are not result effective variables. Therefore, it is improper for the Examiner to

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back surface of the wafer can be alleviated, thereby suppressing the occurrence of slips. Further, since the first jig is made of silicon, defects and/or damages are least likely to be generated in the contacting region of the first jig and the back surface of the wafer, which then makes it possible to support the occurrence of slips.

To summarize, since Kenichi does not teach the first jig and holder as defined in claim 1, this claim is patentably distinguishable from this reference.

The dimensions, surface roughness and flatness specified in claims 2-4 are obtained by the optimal characteristic examination to the effect that the heat treatment jig for semiconductor substrates be structured so that slips do not occur on wafers during high temperature heat treatment with long duration. In the rejection, the Examiner concludes that the limitations of claims 2-4 are not critical and therefore not distinguishing. The Examiner's conclusion of obviousness regarding the recited variables assumes that these variables are known to be optimized. It is submitted herewith that since Kenichi does not even disclose the combination of the first jig and the holder, how could the variables of the two components be known for optimization? The Examiner has not established that the claimed variables are those known in the art to be optimized, and the Examiner does not have a basis to merely conclude that the limitations could be made by the artisan. Therefore, a *prima facie* case of obviousness has not been established against claims 2-4.

RESTRICTION REQUIREMENT

Since it has been demonstrated that claim 1 is patentable over the applied prior art, it is submitted that the restriction requirement and election of species should be withdrawn and claims 5 and 8-10 be passed onto issuance along with allowable claims 1-4. Applicants are

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contend that the surface roughness and flatness of claim 2 is but an obvious variation of Hisashi. Takeshi adds nothing to this shortcoming, and claim 2 is separately patentable over the applied prior art.

The dimensions, surface roughness and flatness specified in claims 2-4 are obtained by the optimal characteristic examination to the effect that the heat treatment jig for semiconductor substrates be structured so that slips do not occur on wafers during high temperature heat treatment with long duration. In the rejection, the Examiner concludes that the limitations of claims 2-4 are not critical and therefore not distinguishing. The Examiner's conclusion of obviousness regarding the recited variables assumes that these variables are known to be optimized. It is submitted herewith that since neither Hisashi nor Takeshi disclose the combination of the first jig and the holder, how could the variables of the two components be known for optimization? The Examiner has not established that the claimed variables are those known in the art to be optimized, and the Examiner does not have a basis to merely conclude that the limitations could be made by the artisan. Therefore, a *prima facie* case of obviousness has not been established against claims 2-4.

It is further argued that the rejection of claim 2 is in error since the Examiner has failed to support the rejection. At most, the rejection says that the combination of Hisashi and Takeshi render claim 2 obvious. However, there is no reasoning other than the citation to In re Woodruff. As explained above, Hisashi and Takeshi are totally different jig arrangements than the invention. Given this disparity, it is not seen how these two references can teach or suggest the limitations of claim 2. The Examiner is called upon to clarify the rejection if maintained in the next action.

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KENICHI

In the rejection based on Kenichi, the Examiner does not identify the first jig and refers to the holder as 30. It is contended that Kenichi does not teach the jig of claim 1, as amended. Kenichi discloses a heat treatment jig to be charged into or discharged from a vertical heating furnace. A ring-like tray 30 is provided to support the wafer of 12 inch size on it. The ring-like tray 30 of Kenichi is made of silicon carbide material and is analogous to the holder of claim 1. Because of the material of the tray 30, when bonding of the back surface of the wafer and the ring-like tray occurs locally, the force of constraint exerts between the back surface of the wafer and the ring-like tray and the wafer is affected by the ring-like tray having the different thermal expansion coefficient. Thus, slip of wafers is very likely to occur.

According to the invention, the first jig that comes into direct contact with the back surface of the wafer is made of silicon. Thus, even if bonding occurs between the back surface of the wafer and the first jig, the induced stress in the bonding region between the first jig and the back surface of the wafer can be alleviated, thereby suppressing the occurrence of slips. Further, since the first jig is made of silicon, defects and/or damages are least likely to be generated in the contacting region of the first jig and the back surface of the wafer, which then makes it possible to support the occurrence of slips.

To summarize, since Kenichi does not teach the first jig and holder as defined in claim 1, this claim is patentably distinguishable from this reference.

The dimensions, surface roughness and flatness specified in claims 2-4 are obtained by the optimal characteristic examination to the effect that the heat treatment jig for semiconductor substrates be structured so that slips do not occur on wafers during high temperature heat treatment with long duration. In the rejection, the Examiner concludes that the limitations of

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claims 2-4 are not critical and therefore not distinguishing. The Examiner's conclusion of obviousness regarding the recited variables assumes that these variables are known to be optimized. It is submitted herewith that since Kenichi does not even disclose the combination of the first jig and the holder, how could the variables of the two components be known for optimization? The Examiner has not established that the claimed variables are those known in the art to be optimized, and the Examiner does not have a basis to merely conclude that the limitations could be made by the artisan. Therefore, a *prima facie* case of obviousness has not been established against claims 2-4.

RESTRICTION REQUIREMENT

Since it has been demonstrated that claim 1 is patentable over the applied prior art, it is submitted that the restriction requirement and election of species should be withdrawn and claims 5 and 8-10 be passed onto issuance along with allowable claims 1-4. Applicants are entitled to a reasonable amount of species, and therefore the election of species as it affects claims 5 and 8-10 should be withdrawn.

SUMMARY

It is submitted that the Examiner has not established a *prima facie* case of obviousness against claims 1-4, either by the combination of Hisashi and Takeshi or Kenichi. Given this allowability, claims 5 and 8-10 should be considered for issuance.

Accordingly, the Examiner is requested to examine this application in light of this response and pass claims 1-5 and 8-10 onto issuance.

If the Examiner believes that an interview would be helpful in expediting the allowance

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of this application, the Examiner is requested to telephone the undersigned at 202-835-1753.

The above constitutes a complete response to all issues raised in the Office Action dated August 3, 2006.

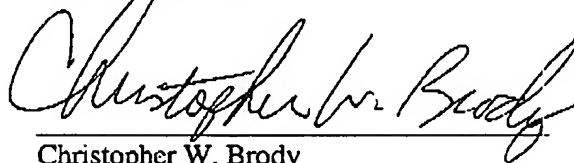
Again, reconsideration and allowance of this application is respectfully requested.

A petition for a one month extension of time is hereby made. Please charge the petition fee of \$120.00 to Deposit Account No. 50-1088. Please charge any fee deficiency to the same Deposit Account.

Respectfully submitted,

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By



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